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IN THREE SECTIONS

Section I

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The Effect of Volume on Profits

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The Effect of Volume on Profits

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EDITORIAL DEPARTMENT NOTE

While the dividend checks to the stockholders of American corporations undoubtedly will be somewhat smaller as a result of the depression, it is true that a different sort of dividend will have been declared as a result of the same cause. This dividend will be in the form of waste elimination, clearer thinking on industrial matters, a cost consciousness rather than a prosperity consciousness, and a number of other by-products that always flow from a harrowing experience such as industry has been passing through during the last few months. No one probably ever will be able to measure the reasons for recovery from depression that can be laid at the door of the enforced serious thinking on the part of management caused by the depression itself.

In one aspect of business, that of cost or industrial accounting, this depression has had a very marked effect. It has made management see the need of some device for forecasting the trend of possibilities in an industry. It has probably brought to them a consciousness of the true forecasting value of accounting and has made them lean more heavily upon their industrial accounting departments for information as to what will happen as they attempt to chart the rather clouded course in which business now finds itself.

Our paper this time deals with a subject that is due for considerably more consideration in the future than it has had in the past. Mr. Francis Burns, the author of this paper, was born in Colorado some thirty years ago. His first accounting experience came as a result of his employment by the Colorado Fuel & Iron Company, one of the large companies in this field and the largest west of the Mississippi River. In 1917 he left the employ of this organization to enter the Great War, but failing in an attempt to get into the military forces went to the United States Navy Yard at Mare Island, California. He still followed accounting work, even in war times, and after about six months at Mare Island, went to work in a ship yard at Vancouver, Washington. During most of his employment there he was Chief Cost Accountant, and as a result of the information that he was able to bring together, the executives of the company were able to see that ships could be produced somewhat more cheaply in the east than they could on the Pacific Coast and in the industrial depression of 1921 the company went out of existence. Following 1921 Mr. Burns traveled widely, much of the time engaging himself as a wireless operator. His travels took him to the Orient, the Philippines and he finally came back to the east coast of this country by way of the Panama Canal and terminated his radio experience by serving on the SS. "Leviathan" immediately after that ship was reconditioned and put into transatlantic service as an American Passenger Liner. Following this two years of travel he became associated with the W. A. Harriman interests in New York in their Industrial Department. He has had a very thorough training in Harriman methods and in his present connection with Cramp-Morris Industrials, Inc., he is carrying out these methods. His paper was delivered before a special meeting of the Philadelphia Chapter held in Reading, Pa., last month.

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THE EFFECT OF VOLUME ON PROFITS

EVERY era in industrial history brings forth some outstanding development, feature or discovery of such outstanding importance or significance as to characterize the period of its event, just as historical ages are currently discussed by referring to the outstanding events falling into those periods. For example, in world history frequent reference is made to the rise and fall of the Roman Empire, yet few people are able to tell just when the Romans enjoyed their peak of power or when the empire began its long descent toward comparative obscurity. The Spanish Inquisition is well remembered for the activities of that period even though the years in which those particular activities were enacted have long been forgotten. In industrial history we find, since the industrial revolution, the decades punctuated with panics, revivals and booms. We also find that these periods have been identified in the minds of industrialists, economists and historians according to their own interpretation of the phenomena responsible for the intensity of the cycle phases. 1921 will be remembered for some time to come as the depression period caused to a very large extent by an over-inventoried condition. In fact, many people thought up until last year that hand-to-mouth buying, that precious lesson learned in 1921, was the panacea of all industrial and economic ills and the violent fluctuations of the cycle had at last been harnessed. Then came 1929 and 1930 and we are still reading from the pens of multitudes just what particular feature of our commercial activities produced the crash and subsequent liquidation. A New York banker blames call loans while an Englishman emphatically declares we have not yet acquired an understanding of the quantity theory of money and therein lies the cause of our economic disturbances. One man says that installment buying is responsible and another says a speedy simulation of installment sales leading to an increase in consumption, is the cure.

A much more fruitful field for debate is offered in discussions of this character than in either of the standard topics of argument, politics or religion, because there are an infinite number of ideas as to the responsibility and remedy and one has only to select the arguments he can most forcefully expound and he will be assured of a pleasant evening with any of his friends.

This is not a discourse on economics or business cycles. I am merely trying to lay the proper background to provide for advancing some ideas on the somewhat neglected science of cost accounting. Whatever name is given to the industrial depression we are at present experiencing, to distinguish it from past and future depressions, will undoubtedly be one which will emphasize its severe intensity; but in my opinion, its title will be incomplete if no thought is given to the question of volume. I refer now particularly to the present day position of the business cycle rather than to the market crash of last year.

Some years ago a business man observed that if he produced more units with the same number of dollars for overhead he obviously reduced the cost of production of each unit by the saving resulting from the redistribution of his burden charges. Thus an instrument of management with great possibilities was born, and just as all facilities of its kind, it fell into the hands of those who used it skillfully and profited by their skill, and, it became the instrument of others, who, lacking that skill, brought losses to their own companies and in some instances of which I have personal knowledge, practically demoralized the price structure of an industry. My discussion will deal principally with this latter group because I find it difficult to assign conscientiously the entire responsibility for this demoralization to management. In my opinion, the accountants are also somewhat to blame.

When President Hoover was head of the Department of Commerce there was executed under his direction some very remarkable work, the object of which was to arrive at a greater degree of standardization in manufactured products, which is another way of saying that the efforts of this commission were aimed at the elimination of waste in industry. This commission classified the reasons for industrial waste into several categories but when it came to assigning the major responsibility for industrial waste to management the commission found itself in accord with the ideas and calculations of our leading economists, namely, that by far the greatest single cause of waste in industry was due to management. I do not wish to dispute the soundness of the analysis but I think that I am perfectly safe in saying that the commission merely determined the waste resulting from unsound methods and policies

established by management and did not delve into the fact that the soundness of the judgment of an executive, except in very rare instances, is to a large degree dependent upon the information he has before him which forms the basis of his decision. I think I may say without fear of contradiction that in this modern competitive industrial age the accountant prepares the major bulk of the data which is utilized in guiding management in its determination of policy and procedure. Now to return to the question of volume. It is quite obvious that a saving in cost of production may be effected by an increase in volume in all cases where it is not necessary to increase overhead expenses in direct ratio to an increase in production; therefore, generally speaking, we may say that increased volume leads to lower cost.

During the period of industrial depression, such as that which we are experiencing at the present time, management has said to itself in a great many cases that if the rule of "increased production produces lower costs" is sound, then it is equally sound that lower cost will result from increased production; and it is at this point that detrimental consequences of great magnitude frequently have been the effect of a hasty decision. To be more specific, let me say that when there was a shrinkage in the volume of business to be secured following the market crash at the end of 1929 there was subsequently an effort on the part of all industrialists engaged in one line of endeavor to secure the major portion of the available business. So, many of our enterprising executives sharpened their pencils and endeavored to divert to themselves a volume of business greater than the normal quantity on which their costs had been calculated with the idea that an over-absorption of overhead would compensate for the reduction in price. This decision was made without consideration as to whether or not such action would produce an increase in the total volume of business, and the unfortunate part of this situation was that practically every executive got the same idea at the same time and in justification of their efforts they pointed to the fact that one of our greatest industrialists, Mr. Henry Ford, had successfully increased his business year after year by a procedure which, for the purpose of our discussion, may be termed quite analagous. At this point let me make it perfectly clear that an increase in volume resulting from a decrease in price creates additional demand only where an industry has to deal with

a class of consumption termed by economists the "marginal purchaser." Now "marginal purchasers" may be defined as those individuals whose purchasing power is in the twilight zone immediately below the price which has been previously asked for the commodity they desire to purchase. Obviously a reduction in price will be an enhancement of their purchasing power and in such cases it is not only reasonable to suppose, but it has been proven in fact that a reduction in price will lead to an increase in consumption. The wisdom of Mr. Ford's policy is therefore obvious. Since he was producing the lowest priced automobile, he increased the quantity of potential purchasers each time he reduced the price. Therefore, I think we can accept as axiomatic the statement that price reduction is of less importance where additional volume cannot be created than it is when that action brings in the potential purchasing power or dollars to be spent, represented by the introduction of marginal consumers. It is true that where price reduction does not increase consumption, it may lead to a redistribution of the total business with the result that one producer may improve his particular position, but this also obviously leads to retrogression on the part of one or more of his competitors. Some degree of success on the part of an enterpriser who uses this scheme of reducing his price to effect a redistribution in volume, will almost invariably lead that particular individual to smile and justify his actions by the well-known phrase that "competition is the life of trade", and yet a more comprehensive view of the situation as a whole cannot but help to lead to the conclusion that such tactics may be more accurately described as "the death of trade."

In my limited experience, I have seen cases where competitors have been run completely out of business, forced into a receivership, their assets liquidated for the benefit of creditors, the stockholders taking the residue, if any. The competitors who were responsible for the situation smiled blandly because they felt that at least a portion of their competition had been eliminated, and before the smile had worn off their faces I have seen the plant and equipment of such liquidated concerns repurchased at very low prices which enabled the purchasers to establish themselves in the same line of business with much lower fixed charges, which meant lower overhead rates and with a comparable degree of efficiency in production, much lower costs, so that the net effect was that the entire

industry had been harmed rather than helped and in addition the price cutting which had been necessary to drive this particular competitor out of business had also resulted in decreased funds for development work and modernization with the net result that the improvement of the particular art had been seriously hampered.

It is curious to note that the consistency necessary to the complete justification of our American standards of living is frequently lost when it comes to dealing with an industry rather than an individual. Many of our leading industrialists have advanced the well founded theory that high wages were necessary to continue the high standard of living developed in the United States and that the high standard of living leading to a high quantity and high quality of consumption was necessary to continue our industries and it was necessary to continue our industries to continue the high wages being paid to our American workmen; thus, the cycle seems to be complete and in order to insure its security such legislative measures as the tariff and immigration laws have been enacted. The inconsistency, as I see it, comes in when we fail to recognize that if a workman is worthy of his hire, so is an industrial enterprise and if an industrial enterprise is guided by a misconception of the effect that price reduction has on earnings, the net result is bound to be a decrease in the net return. A decrease in the net return inevitably leads to a decrease in the quantity of funds available for distribution to the workmen, the vendors and the stockholders. The decrease in the funds allotted to the vendors has the same effect in their industries as it has in the industry under consideration with a net result which can be no other than a very effective restriction of consumption. As prices continue to decline this condition becomes cumulative until in its final stages it becomes necessary for organizations interested in human and industrial welfare to lend strenuous efforts to re-establish confidence in increased consumption. An excellent example of this is the very strenuous campaign started by the Philadelphia Chamber of Commerce in their endeavors to re-establish the stability of business by urging every one to "*buy now.*" I believe that I have indicated so far that there are certain definite economic hazards involved in price reduction and this is said, of course, without any desire to champion price extortion.

I believe a workman is worthy of his hire and in an effort to be

consistent I believe the same is true of an industry or an enterprise. I also believe that many of these steps taken toward price reduction which usually lead to restricted consumption might be partially avoided if those executives who are responsible for the steps taken were better fortified with figure facts to show the real untainted truth of what may happen as a result of their actions. I believe it lies within the scope of the ability and responsibility of the accountant to enlarge and perfect his activities along these lines. I believe that if many executives knew the real effects of some of their actions in this direction, their decisions might be modified or entirely reversed. In order to clarify these opinions of mine I am going to take a hypothetical example, which, while being hypothetical, is not so far from being analagous to what might represent a real concrete case. I have selected in this theoretical example a manufacturing concern engaged in the production and distribution of a product sold in competition with a number of concerns of comparable size in the same industry. The revenue for carrying on this business with a normal volume of operations, we shall say, is as follows:

Materials	$200,000	Per Month
Direct Labor	50,000	" "
Variable Expense	25,000	" "
Fixed Expense	50,000	" "
Sales Expense	25,000	" "

By material I mean the materials purchased for processing in this company's factory. Direct labor I define as that labor directly expended in the processing which has to do with the form, structure or substance of the product. Variable expense is that element of overhead which fluctuates in approximate direct ratio to the fluctuation in productive activity. Fixed expense is comprised of those expenses which do not fluctuate between the maximum and minimum rates of production. It includes such items as taxes, insurance, depreciation and, in addition, what might be termed "nucleus overhead", such as the minimum organization necessitated to carry on the business at its lowest point of activity. The management, a skeleton structure of clerical departments, shop superintendent and such individuals would fall into this category. Sales expense is, of course, that expense necessitated in the act of

distributing the manufactured product to the consuming market. The figures listed above are, of course, intended to represent the requirements of the enterprise under considration at 100% of normal production. Normal is not to be confused with capacity. I believe I am safe in saying that practically every industrial organization, in calculating a basis for the distribution of its overhead, deals entirely with the normal factor which will be somewhat below full capacity. Otherwise, they would be excluding the possibility of reaping a profit from an increase in volume and would be incurring the hazard of a loss resulting from under-absorption of overhead every time the production dropped below full capacity.

Figure No. 1 shows the tabulation of the labor, overhead and sales expenses incurred by the organization under consideration at varying volumes of production. The purpose of this tabulation is to illustrate in concrete form the effect on earnings when there is either a subnormal or abnormal rate of activity. Specific note should be taken of the rate at which the overhead element decreases above normal, compared to the rate at which it increases below normal. In order to illustrate this graphically, figure No. 2 has been prepared. A glance at this graphic presentation will be sufficient to demonstrate the fact that a decrease in volume must be accompanied by a substantial increase in price if the break-even point is to be maintained; also that any decrease of price, made with the intention of attracting an increase in volume, must result in a substantial volume increase in order to avoid a loss. Note particularly the tendency of the overhead expense curve to flatten out after the normal volume has been reached; also note the quickness with which the curve ascends when volume drops below normal.

We now come to the point where, I believe, accountants may be of definite and substantial value to the executives in assisting the latter to formulate their policies with due regard to the question which is the subject of this discussion; namely, *the effect of volume on profits*. I believe that an executive should be in full possession of all the information necessary to enable him to determine the net result which is to accrue to his company as the result of any action he takes which may involve, in any way, a deviation from the normal policy. This is a particularly important question at the present time, because I believe I have accurately presented the fact

% Normal Production	Monthly Direct Labor	Variable Expense $	Variable Expense %	Fixed Expense $	Fixed Expense %	Sales Expense $	Sales Expense %	Total Expense $	Total Expense %
0	0	.....	0.	50,000	...	25,000	..	75,000	....
10	5,000	2,500	50.	50,000	1,000.	25,000	500.	77,500	1,550.
20	10,000	5,000	50.	50,000	500.	25,000	250.	80,000	800.
30	15,000	7,500	50.	50,000	333.	25,000	167.	82,500	550.
40	20,000	10,000	50.	50,000	250.	25,000	125.	85,000	425.
50	25,000	12,500	50.	50,000	200.	25,000	100.	87,500	350.
60	30,000	15,000	50.	50,000	167.	25,000	83.	90,000	300.
70	35,000	17,500	50.	50,000	143.	25,000	72.	92,500	265.
80	40,000	20,000	50.	50,000	125.	25,000	63.	95,000	238.
90	45,000	22,500	50.	50,000	111.	25,000	55.	97,500	216.
100	50,000	25,000	50.	50,000	100.	25,000	50.	100,000	200.
110	55,000	27,500	50.	50,000	91.	25,000	45.	102,500	186.
120	60,000	30,000	50.	50,000	83.	25,000	42.	105,000	175.
130	65,000	32,500	50.	50,000	77.	25,000	38.	107,500	165.
140	70,000	35,000	50.	50,000	71.	25,000	36.	110,000	157.
150	75,000	37,500	50.	50,000	67.	25,000	33.	112,500	150.
160	80,000	40,000	50.	50,000	63.	25,000	31.	115,000	144.
170	85,000	42,500	50.	50,000	59.	25,000	29.	117,500	138.
180	90,000	45,000	50.	50,000	56.	25,000	28.	120,000	134.
190	95,000	47,500	50.	50,000	53.	25,000	26.	122,500	129.
200	100,000	50,000	50.	50,000	50.	25,000	25.	125,000	125.

FIGURE 1

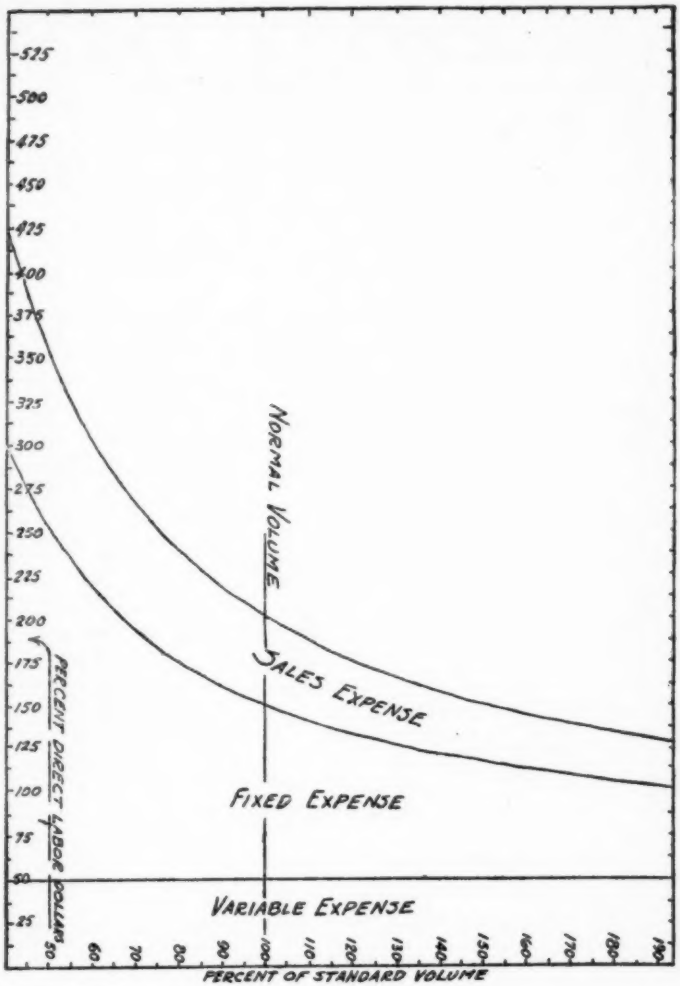
525
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
PERCENT DIRECT LABOR DOLLAR
NORMAL VOLUME
SALES EXPENSE
FIXED EXPENSE
VARIABLE EXPENSE
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
PERCENT OF STANDARD VOLUME

FIGURE 2

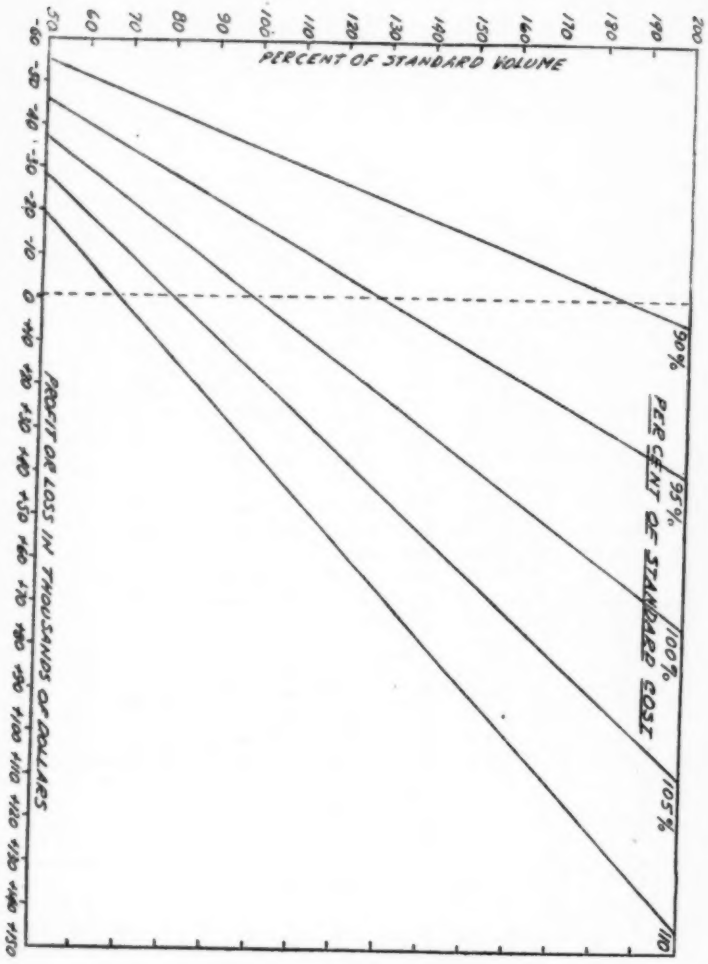
PERCENT OF STANDARD VOLUME
50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
PROFIT OR LOSS IN THOUSANDS OF DOLLARS
-60 -50 -40 -30 -20 -10 0 +10 +20 +30 +40 +50 +60 +70 +80 +90 +100 +110 +120 +130 +140 +150
90%
95%
100%
105%
110
PER CENT OF STANDARD COST

FIGURE 3

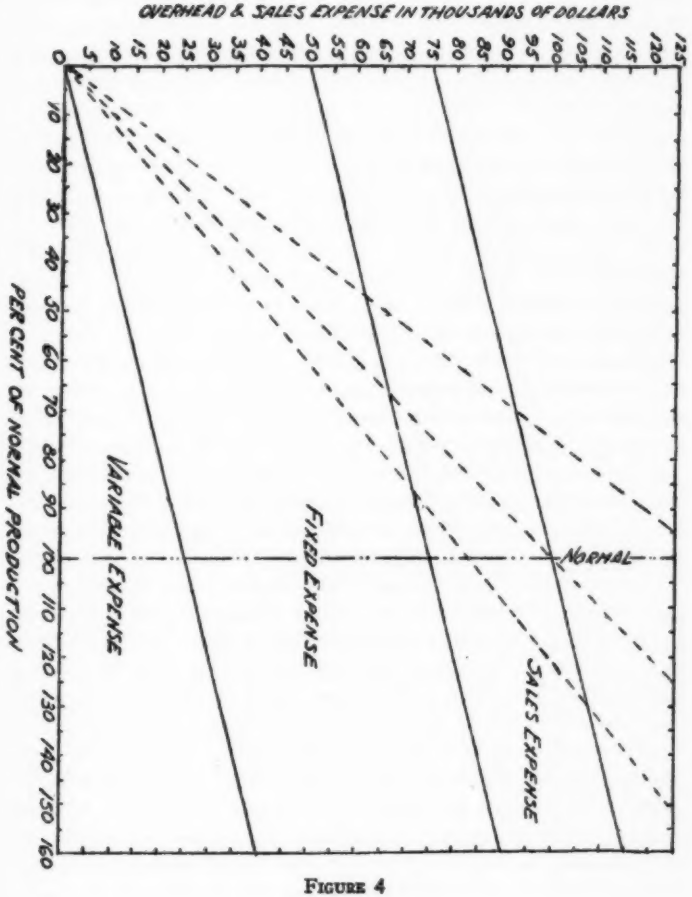
OVERHEAD & SALES EXPENSE IN THOUSANDS OF DOLLARS
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
PER CENT OF NORMAL PRODUCTION
VARIABLE EXPENSE
FIXED EXPENSE
NORMAL
SALES EXPENSE

FIGURE 4

that in cases of a restriction in consumption there is an almost invariable tendency on the part of executives to "get theirs" by reducing price. By taking the figure facts presented above, it becomes a very simple matter to prepare a graphic chart, such as is illustrated in figure No. 3 in order to demonstrate definitely just what is going to be the net return to the enterprise under conditions of varying volume at varying prices. This chart shows the volume necessary to break even at prices ranging from 90% to 110% of full standard cost; or, in other words, from selling at a loss of 10% to a profit of 10%. You will note here a presentation of substantially the same facts which are illustrated in figure No. 2; namely, that a decrease in price is quite difficult to offset by an increase in volume. There is a very definite concentration of the profit lines behind the dotted line which represents normal, while the tendency toward profit earning above the line of normal production presents a rather optimistic picture.

Now we turn to figure No. 4, which is perhaps not quite as easy to understand as the 3 preceding figurative presentations, but is, nevertheless, in my opinion, the one chart which should be in the possession of every executive who is placed in the position of having the responsibility of determining the policy of the company as regards the factors of price and volume. Beginning from the bottom, the first line represents the total variable expense which would be incurred at volumes ranging from zero to 160% of normal. Since the variable expense has been defined as that portion of overhead which fluctuates in direct ratio to fluctuations in the rate of production, this is obviously an ascending straight line from zero to the total amount of dollars required for this type of expense at 160% of normal activity. Superimposed on this area is the fixed expense which, remaining stationary at all rates of activity, becomes merely a straight line at a definite distance above the variable expense line. Exactly the same is true of sales expense. There might be some question about treating sales expense as a fixed number of dollars, but when consideration is given to the fact that sales expense is rarely restricted in case of a declining market because of the strenuous efforts on the part of the management to divert business to their particular enterprise, I believe the logic of treating this as a fixed sum will be conceded. Now we come to the function of the dotted lines. Let us assume that it has become dif-

ficult in the industry under consideration to maintain a normal volume of business at normal prices; therefore the management's attention has been directed to the question of holding together its organization by distributing its product at prices which will either afford a break-even point or a minimum of loss. The management will, under such circumstances, give consideration to those elements of expense which might be sacrificed in order to attract a maximum volume of business, thereby either breaking even because of a volume greater than normal or by sustaining a minimum loss because of reduced prices. In the illustration presented in figure No. 4, volumes of 70%, 100%, 130% have been chosen and the dotted lines represent the net result at these 3 respective rates. Let us assume that a restriction in consumption has led the management to adopt the policy of submitting quotations based upon their attracting to their own enterprise 30% more than the normal volume. This will, of course, result in quoting prices considerably below that which would be quoted if normal prices at normal volume were utilized. The next step is to measure the net result accruing to the company by the adoption of such a policy. This can be done by drawing a straight line from the zero point to the intersection of the top line representing total expense at 130% of normal volume. This is the illustration used in the right-hand dotted line shown in figure No. 4. Since the policy of quoting at reduced prices has been adopted and these reduced prices are comparable to an increase in volume of 30% necessitated to break even, it will be obvious that the intersection of the dotted line with the total expense line will produce that break-even point. If a volume in excess of 130% of normal is achieved, the net profit resulting therefrom can be determined by continuing along the dotted line and merely taking the area between the dotted line and the total expense line. That area will represent the profit due to over-absorption. On the other hand, and this unfortunately is the case more usually experienced, if the volume falls below that on which the quotations were based, the loss sustained as the result of this policy can be determined in the same manner; that is, by measuring the area between the dotted line and that of the total expense line; but in this case you will note that the dotted line is below the total expense line and the net result is therefore a loss.

In summarizing, I wish to say that the intent of this discussion

of mine is to present to the accounting profession methods by which I believe the value of their services can be enhanced. I do not wish to speak disparagingly of the value of accumulating costs as they are expended. There always has been and always will be a real value attached to accurate cost accumulation, but for some years past, the demand of management has been for a better presentation of what might happen as a result of new policies instituted, rather than what has occurred in the past and is therefore forever lost. It has been stated accurately and wisely that "once a dollar has been spent all the accounting in the world will not bring it back."

The real need in this competitive age, as I see it, is a better determination of what is going to happen as the result of the institution and execution of new policies. I have endeavored to present here only one of the many things which may be offered as a guide to management. I am convinced after my own experience and observation in the present period of depression that the full economic significance of the effect of volume on profits has not been thoroughly understood. The National Association of Cost Accountants, sensing the significance of this subject, sent out questionnaires to practically all representative American industrial concerns, asking the management's opinion on the question of doing business at or below full normal cost. This action was taken by the N. A. C. A. prior to the convention held by that organization in Chicago, in 1927 and repeated in the 1927 Yearbook, pages 21 to 90. It is true, I believe, that the majority of concerns replying definitely stated that they did not believe it advisable to take business at or below full normal cost under any conditions whatever, but there was a sufficient number of dissenting opinions to warrant further investigation. I have endeavored to continue along the lines of pioneering instituted by the N. A. C. A. at that convention, and I am quite sure that if this subject is given serious thought and analytical study by the accounting profession, it will be productive of a very beneficial type of information which will enable executives to plot their future course of action with a greater degree of clarity and intelligence than it has been possible for them to exercise heretofore.

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